Subject Code : P8MA3

CC III: NUMERICAL METHODS

Unit I: SOLUTION OF NONLINEAR EQUATIONS:

Newton's method – Convergence of Newton's method – Bairstow"s Method for quadratic factors NUMERICAL DIFFERENTIATION AND INTEGRATION: Derivatives from Differences tables – Higher order derivatives – Divided difference, Central-Difference formulas – Composite formula of Trapezoidal rule – Romberg integration – Simpson's rules.

Unit II: SOLUTION OF SYSTEM OF EQUATIONS:

The Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method – Matrix inversion by Gauss-Jordan method – Methods of Iteration – Jacobi and Gauss Seidal Iteration – Relaxation method – Systems of Nonlinear equations.

Unit III: SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Taylor series method – Euler and Modified Euler methods – Rungekutta methods – Multistep methods – Milne's method – Adams Moulton method.

Unit IV: **BOUNDARY VALUE PROBLEMS AND CHARACTERISTIC VALUE PROBLEMS:**

The shooting method – solution through a set of equations – Derivative boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration – The power method.

Unit V: **NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS:**

(Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations) Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace equation – The Poisson equation – Derivative boundary conditions – Solving the equation for time-dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method – solving the wave equation by Finite Differences.

Treatment as in:

1. APPLIED NUMERICAL ANALYSIS' by C.F.Gerald and P.O.Wheatley, Fifth Edition, Addison Wesley, (1998).

Reference Book:

1. S.C. Chapra and P.C. Raymond: Numerical Methods for Engineers, tata McGraw Hill, New Delhi, (2000)
2. R.L. Burden and J. Douglas Faires: Numerical Analysis, P.W.S.Kent Publishing Company, Boston (1989), Fourth Edition.
3. S.S. Sastry: Introductory methods of Numerical Analysis, Prentice Hall of India, New Delhi, (1998).